

Abstract of the Disclosure

A semiconductor device for use in a memory cell includes an active matrix provided with a silicon substrate, a transistor formed on the silicon substrate, a capacitor structure formed over the transistor, a metal interconnection for electrically connecting the capacitor structure to the transistor, a barrier layer formed on top of the metal interconnection and an inter-metal dielectric (IMD) layer formed on top of the barrier layer, wherein the barrier layer is made of a material such as Al_2O_3 or the like. The IMD layer is formed by using a plasma chemical vapor deposition (CVD) in a hydrogen rich atmosphere, wherein the barrier layer is used for preventing the capacitor structure from the hydrogen.